Zürcher Hochschule
für Angewandte Wissenschaften

zh aw

**Angewandte
Psychologie**

www.psychologie.zhaw.ch

Masterarbeit

Paternalism in chimpanzees

Do chimpanzees help conspecifics by giving them
what they want or by responding to what they need?

Leïla Rym Benziad

Vertiefungsrichtung Klinische Psychologie

Referent: Prof. Dr. Michael Tomasello

Leipzig, Mai 2014

Abstract

Prosocial behavior has been of interest in social, developmental, as well as in evolutionary psychology as an essential component of cooperation and altruism. In particular the phylogenetic origins of helping behavior and the degree in which it is unique in humans, are still a matter of debate. To further our understanding of the evolution of cooperative and prosocial behavior in humans it is fundamental to compare it to humans' closest living genetic relative, chimpanzees. While recent research has investigated the motivation underlying helping behavior in young children, very little is known about the factors affecting helping behavior in non-human primates. The question is whether such behavior is motivated by a genuine concern for others' need. In the present study, nine chimpanzees (Pan troglodytes) of the A group from the Leipziger Zoo were presented in a situation in which a conspecific needs an object to continue a task. Crucially, subjects were faced with two alternatives. They could either provide the tool, relevant to the conspecifics need or an irrelevant tool, which would not fulfill the actual need. Moreover the conspecific, the stooge, was trained to always reach for the irrelevant object because an occluder obstructed his view. Therefore the subjects could either help by simply completing the reach (and providing the irrelevant object) or help paternalistically by correcting the conspecifics and providing the tool relevant to his genuine need. The results showed that chimpanzees were more motivated to provide a tool compared to closely matched control in which the type of the object did not matter for the conspecifics. Moreover the majority of the subjects helped by correcting the beneficiary more often in the experimental compared to the control condition. These findings provide some evidence that chimpanzees are not merely motivated to complete action sequences but actually respond to the need of others'. The phylogenetic roots of genuine prosocial behavior may run deeper than previously assumed.

Keywords: prosocial behavior in chimpanzees, paternalism, instrumental helping, goal understanding, motivation

Table of contents

Tables

Figures

Abbreviations

i.e.   *id est (Latin).* Zu deutsch „das heisst"

e.g.   *exempli gratia (Latin).* Zu deutsch „zum Beispiel"

In humans, after children begin to explore the world, start to walk, to talk, and become cultural beings, they also naturally help others and begin to cooperate. Helping is a phenomenon, which occurs in multiple forms and includes the ability to perceive the goal of another individual in different situations. Given that helping emerges early in ontology it had been suggested that it is driven by a predisposition to help others instead of being a merely learned behavior. In different situations, where instrumental help is needed, children help independent of parental encouragement and rewards. This behavior has been documented in other cultures, too, as it is likely based on sympathetic emotions that are fostered by culture and socialization (Tomasello, 2008). In general, humans appear more motivated to cooperate and show more helping behavior than chimpanzees, humans closest living relative, even when they are closely related, which could partly be consider taking part for evolutionary success (Silk, 2006). Nevertheless, despite chimpanzee helping behavior being less frequent, studies have shown that chimpanzees are able to understand conspecifics goals and show cognitively advanced targeted helping behavior, depending on conspecifics needs (Yamamoto, Humle & Tanaka, 2012). The present study seeks to further investigate the degree to which chimpanzees are sensitive to others' needs. From a psychological point of view, this can provide further insights into the evolution of the motivational mechanism underlying helping behavior.

Helping

From a very early age, young children show prosocial behavior. With increasing age and exposure to different social contexts, helping develops to and becomes a complex phenomenon.

Helping behavior is a form of cooperation. The emergence of prosocial behavior, especially toward non-kin strangers, poses a challenge for evolutionary theories. On the proximate level the question arises as to what motivates one individual to carry behavior benefitting others. Despite the selfish aspects of human behavior, prosocial behavior toward unrelated people, too, is a characteristic of human nature. It has been suggested that the motivation to help does not necessarily arise from conscious and calculated decisions. Rather humans appear naturally motivated to care about the wellbeing of others (Rand, Greene & Novak (2012); Tomasello, 2012). While the question regarding the long-term pay-offs of helping refer to ultimate explanations of why individuals cooperate, the question of what motivates prosocial behavior refers to proximate explanations. These include the cognitions, emotions,

and motivations that lead to cooperative behavior. Proximate mechanisms, in decision-making, are typically advantageous in the sense of running out engagement of cost efforts based on the estimation of future returns. Hence, prosocial behavior seems to emerge from intrinsic motivations, which in turn results in extrinsic stimuli making cooperation favorable (Jordan, Peysakhovich & Rand, 2014). On a group level, cooperative behavior serves the function of regulating social interactions in the general direction of moral behavior, which requires individuals to repress their own selfish-interest by helping or sharing with others with regard to reciprocity, justice and equity (Tomasello & Vaish, 2013). Therefore, cooperation or collaboration can be regarded as the active assistance or support of other individuals and with increasing costs for the helper such behavior can be termed altruistic (van Schaik & Kappeler, 2006). One form of prosocial behavior is instrumental helping, i.e., fulfilling others' goals that differ from other types and forms of altruism, such as sharing goods and providing information (Tomasello, 2008). Therefore, helping involves to some degree the ability to understand others intentions and goals.

In short, helping or prosocial behavior, is a key aspect of human nature and in the following it will be reviewed how helping emerges early in ontogeny and to what degree non-human primates have been shown to help one another.

It has been suggested that sympathy and empathy play a key role in the motivation of prosocial behavior (Liebal, Vaish, Haun & Tomasello, 2014). These emotions allow humans to both take another person's perspective and to be motivated to alleviate their distress (Vaish, Carpender & Tomasello, 2009; Zahn-Waxer, Radke-Yarrow & Wagner, 1992). Together with the possessing of knowledge about other's goals and the way to achieve them, as well as the potential obstructions to the goals, these cognitive abilities and motivational aspects of helping behavior, especially when there is no benefit towards the helper himself, requires a huge effort and beside that it is costly. Moreover, helping others to achieve their goals seems to occur naturally in children, even when there are no immediate benefits for the helper and when the recipient is a stranger (Warneken & Tomasello, 2006, 2007). This motivation is intrinsic given that it is undermined by extrinsic rewards (Warneken & Tomasello, 2008). This intrinsic motivation stems from the fact that the person in need should be helped. More specifically, young children help out of a genuine regard for the wellbeing of others from as early as two years of age (Hepach, Vaish & Tomasello, 2012). Furthermore, children diverse prosocial behavior from an early age by identifying the needs of others (Dunfield, Kuhkmeier, O'Connell & Kelley, 2011). Although prosocial behavior develops early in life and from

an evolutionary point of view, selective pressure seems to play a key role in terms of sociability, it is not clear if instrumental behavior in children is a pure form of altruism, representing the behavioral phenotype selected in human evolution (Hay, 2009).

In sum, helping and cooperative acts can be defined as prosocial behavior, key aspects of human nature, crux of human existence. From a cognitive point of view, the unachieved goal of the recipient must be understood from the helper. Additionally, the helper has to posses a certain kind of altruistic motivation to perform a helping act. The main difference between helping and cooperating is that to help another individual achieve his goal, it should be enough to understand his or her goal. By contrast, in cooperation, it is necessary to act based on the formation of a shared goal. Having a shared goal, helper and recipient have to act interdependent in their roles, always motivated enough to work together, supporting each other, to achieve the shared goal (Warneken & Tomasello, 2007).

Helping in children

Children, from an early age, understand and identify others unfulfilled goals and are motivated to help achieve their goals (Warneken & Tomasello, 2009). They open doors and help to retrieve out-of reach objects for others (Warneken & Tomasello, 2006). After the age of 12 months, infants show the cognitive ability to provide helpful information to another person, who is searching for an object, to direct their attention. Motives such as informative pointing and pointing gestures are based on the imperative wanting of something from an adult and declarative pointing for an adult's attention towards an interesting event or object and to give some information of the location of something a person is searching and looking for. Therefore from an early age, humans seem to have a concept of the informational states of people as intentional agents. Additionally they are motivated to communicatively provide such information (Liszkowski, Carpender, Striano & Tomasello 2006). At the same age of 18 months, children's spontaneous help increase after exposure to affiliation primes compared to individuality primes (Over & Carpender, 2009). Even without social or material rewards, 20-month-old children are highly motivated and show a strong tendency to help others. This also applies to situations in which children have to disengage from a pleasant activity to provide help (Warneken & Tomasello, 2008). Furthermore, even at a younger age, taking into consideration actions of people towards others by appraising individuals as pleasant or not, 6 and 10 month old children prefer helping individuals rather than characters hindering others. Addi-

tionally, comparing helping versus neutral individuals, they prefer the helping one and the neutral one compared to the hinderer (Hamlin, Wynn & Bloom, 2007).

Furthermore, children at the age of 18 and 24 months engage an adult who stopped cooperating as if reminding him of the joint goal (Warneken, Chen and Tomasello, 2006).

For children at the age of 2 and 3 years, providing help to an adult to complete an interrupted action-related goal, seems to be much more easier, than empathic helping behavior in order to somehow ease emotional distress in an adult partner. With increment of social understanding, 30-months old children begin to show more autonomous prosocial behavior. Giving the same behavior, the social-cognitive and motivational aspects of such early prosocial responding, however, might differ in terms of age, depending on the social-cognitive and motivational abilities of children. Compared to older children and adults, this can be due to a different social understanding (Svetlova, Nichols & Brownell, 2010). With increasing age, children more and more internalize cultural social norms and expectations, increasing the likely reciprocity and judgment of others in the cooperativeness in human evolution, taking place in children's life, influencing their prosocial behavior (Tomasello, 2008).

Providing help to others is therefore much more complicated than only the required fulfillment of ones' request. For instance, when someone requires for an unsuitable object to accomplish an ultimate goal, paternalistic behavior might be a quite useful form of helping. Showing paternalistic helping behavior, the helper doesn't act the way another requires, assuming that he or she knows better than the recipient what's the best way to help achieve the goal. Therefore, paternalistic helping behavior is not simply responding to others' request or providing help in terms of goal directed actions. The helper needs complex cognitive abilities to differ between an ultimate goal underlying the request and the immediate request itself. Moreover, the helper has to realize that the ultimate goal has to be prioritized. To further into the complexity of paternalistic helping behavior, an additional factor, crucial to be able to act paternalistically, is the ability to understand the difference between more or less useful means of a goal. Furthermore, there must be an understanding that another individual might misunderstand or confound the means to achieve the suitable goal. Additionally, the character of a requested object has to be clear to the helper to ensure his understanding of its possible inappropriate and unsuitable use in different contexts. At the age of three, children are able to provide an object to another person, being conscious of which one will work the best for the recipient to achieve his goal. Moreover, they do it by ignoring an explicit request for an unsuitable object. Therefore, at this early age, children are able to provide help in a paternalistic

way, deciding on how to help in the best way when the partners' request is inconsistent with his goal. It remains unclear if children's' offer emerge from the fact, that they prefer to provide a functional instead of a dysfunctional object because of it's useful mean or if their offer is based on the recognition of the possible useless function for the recipient to achieve his goal. Moreover, children at that age are able to dismiss the request of their partner providing them with a better object to achieve their goal and they do it, even if the partner's awareness of requesting an inappropriate object leading to the wrong way to achieve his goal is not explicitly clear (Martin & Olson, 2013). However, prescriptively, paternalism has action and reason based components. Therefore one characteristic of paternalisms is a kind of connection of action and reason (Grill, 2007).

Helping in chimpanzees

In young children, the motivation underlying helping behavior has often been an investigation topic, but up to date, nothing is known about the factors affecting helping behavior in chimpanzees, humans' closest genetic relative.

To show a motivated based helping behavior towards a partner implicates the recognition of the relationship between different actions in the necessity to achieve a goal. In chimpanzees, a possible motivation in developing helping behavior to perform successfully with a partner is the way they look at them, namely as some kind of a social tool, needed to achieve outcomes that ultimately helps themselves, rather than a collaborative interaction based upon joint plans and joint goals. Nevertheless, a cognitive process allowing chimpanzees the representation of interrelationships between different actions is needed and is not in contradiction with the social tool interpretation. In collaborative tasks, chimpanzees seem to be strategic collaborators, capable of paying attention to their partner and his actions. Many of the possible limitations in chimpanzees' collaboration seem to be based more on motivational than on cognitive factors (Melis & Tomasello, 2013).

Investigating accurate conditions in which chimpanzees are willing to help conspecifics or humans, Warneken, Hare, Melis, Hanus and Tomasello (2007) indicate experimental evidence for helping in its basic form, between conspecifics and towards humans. Chimpanzees are able to help spontaneously and repeatedly and even without receiving rewards. Ruling out reciprocity and immediate return benefits by testing chimpanzees performing with unfamiliar humans and manipulating the reward availability, chimpanzees spontaneously help

a human partner, struggling to reach a goal i.e., to get an unreachable stick, but reachable for the chimpanzee. And they do it even if the task provides no rewards. Increasing the cost of helping, chimpanzees also climb up to help. Again, never being rewarded for helping in such a task, chimpanzees are still willing to help. Interestingly, in a more complex experimental setup, chimpanzees even help their partner by removing the peg holding the chain and therefore ensuring access to the room and food for their partner, by untying a chain beyond the partners' control. Having previously obtained help from a conspecific, chimpanzees provide help more often by opening doors, rather than in a control condition without partner, but seem not to favor the individuals who themselves helped them before. However, obviously chimpanzees and humans share decisive aspects of altruism (Melis, Hare & Tomasello, 2008).

In strategic helping collaborative task, for instance, consisting of tool transfer, despite the rapidity in which they performed, chimpanzees provide their conspecific partners the needed, significant tool most of the time. The simple explanation that chimpanzees just discarded the incorrect, not needed tool, seems not to fit with the fact, that they transferred the tool right to the recipients hand or room and that they chose the correct tool, independently of the role they perform in the task. They still pass the correct tool, if they successfully used it or if it was not working before (Melis and Tomasello, 2013). Even if their ability of reasoning about a partners need can still be questioning and even if there is a probability that they just keep the previously used tool or the one they would like to use, the ability of chimpanzees' altruistic helping behavior by transferring a tool to a partner who needs to access food, was also showed by Yamamoto et al. (2012). Depending on conspecifics needs, therefore there is empirical evidence for flexible targeted helping behavior in chimpanzees. As long as the chimpanzees are able to visually assess the conspecifics dilemma, they apparently are able to understand conspecifics goals and show cognitively advanced targeted helping behavior. Moreover, according to Melis, Warneken, Jensen, Schneider, Call and Tomasello (2011), even the presence of food seems not to constrain the tendency of chimpanzees to help others. On the other hand, it is the active behavior of the recipient, which seems to play a main role in their helping behavior. The fact that chimpanzees help recipients to get both, edible and non-edible food rewards, seems to be a main factor in not supporting the food hypothesis in sense of an explanation for conflicting findings in literature. The competitive relationship between chimpanzees over resources seems not to prevent them from possible helping behavior in a not actual and immediate food access situation. Therefore it is the active trying of the recipients to obtain a reward and the signal they show towards the helper, which elicit helping be-

havior in the subjects. Even if it could be possible that the recipients signals have a harassing function, leaving aside the fact that the donors behavior is prosocially motivated, it has to be mentioned, that even if they can beg, they are not directly engaged in harassment. The fact that the active behavior of the recipient can be evaluated as a form of stimulus or local enhancement by catching the helpers attention to the apparatus to manipulate it, can not completely be ruled out.

The motivation affecting non-human primates' prosocial tendencies like supporting in food sharing, hunting, in fights and or in the comfort of conspecifics, is not the reason of its evolution though. In fact, apparent self-serving behavior can be sincerely unselfishly motivated, which leads to a suggested distinction between altruistic and cooperative behavior in terms of an actors awareness of benefits leading him to a potentially selfish motivated cooperation and altruistic action in order to target the benefits and motivationally autonomous altruistic behavior towards others in need, pain or distress, without obvious rewards for the actor and like in humans, based on an altruistic impulse out of empathy, which might lead to such prosocial behavior. However, generalized reciprocity, implying no partner-specific contingency, symmetry-based reciprocity, implying similar behavior of dyads in both directions, attitudinal reciprocity, implying parties reflecting each others social positions and calculated reciprocity, implying partner-specific given and received favors in delayed contingency, are different proximate mechanism ensuring diffusion of helping behavior (deWaal & Suchak, 2010). So in terms of primate order, cooperation is a characteristic, referring to social interactions by cost to the one and benefits to others. With accentuation on the behavior, cooperation can therefore be seen as the active or supporting act from individuals toward another. Costly for the actor, cooperative acts are defined as altruistic, nepotistic, if the recipient is a relative. In that term of definition, cooperation can be understood as single behavioral act, long-term strategies or roles, benefiting other individuals. Apart from humans, who are more likely to engage more often in group-level cooperation, in nature, cooperation mostly is in terms of dyads (Kappeler & van Schaik, 2006). However, forming long-terms relationships with each other and being able to understand third parties relationships as well, chimpanzees live in a highly complex social context. Almost every behavioral decision is made in a complex field including all individuals in proximity having their own goals and perception and the social relationships with other group members and to the self. In such complex social structures, competition seems to play a main role, which mainly occurs in forms of dominance or by making alliances. Such cooperative behavior requires the recognition of ongoing social rela-

tionships as well as complex social cognition skills, which leads to helping behavior, sharing and collaboration (Tomasello & Vaish, 2013).

In collaborative tasks, where children have to work together to get a reward by lifting up a stick simultaneously, but one child gets the reward before the other one, 3 years old frequently help their partners also to get the reward, even if they already have obtained theirs. In such joint goal collaboration children seem to feel a kind of obligation to follow through these interactions in order to make sure, that everyone obtain their reward, which demonstrates strong prosocial motivation. In such collaborative interactions, altruism together with helping behavior plays an important role. Initially emerging inside mutualistic collaborative activities, based on joint goals, where subjects provide help, which in return helps themselves as well, children are able to help in terms of shared intentions, performing actions in pursuit of a joint goal. It still remains unclear, if chimpanzees have the same ability. Compared to human children, being very engaged in supporting others in collaborative tasks with joint goals, chimpanzees' helping behavior doesn't increase in such mutualistic contexts. Although there is evidence that chimpanzees show diverse forms of helping behavior, collaborative activities seem not to ease such behavior like in humans, which leads to the hypothesis, that for instance altruistic acts of chimpanzees and humans might emerge differently in evolution (Greenberg, Hamann, Warneken & Tomasello, 2010).

While, based on possible altruistic motivation and on the possible attempt of receiving future favors in return, unrelated pairs and non-group members of bonobos for instance, share food by releasing a recipient from an adjacent room by voluntary opening the door in order to share their own food instead of having and eating the food all alone (Hale & Kwetuenda, 2010). No significant evidence of helping behavior in gorillas, bonobos and chimpanzees were found, investigating helping behavior in form of transferring sticks to conspecifics in different conditions. Obviously, in that task, only orangutans help their conspecifics, when help is needed (Liebal et al., 2014). It is also only in orangutans, that in terms of calculated reciprocity, direct token gifts of individuals directly delivered into conspecifics hand or mouth was observed, showing the ability required for calculated reciprocity. Even if all four great ape species seem to be able to learn to exchange a correct token with the experimenter, it seems to mostly occur out of a response to requests like hand begging or pointing and therefore it remains unclear, if the apes really take into account the value of the partner's token. Still, the high rate of repeated gifts and begging gestures in orangutans seem to be a clear indication of their ability to understand their partners need (Pelé, Dufour, Thierry and

Call, 2009). Moreover, to examine the ability and flexibility of chimpanzees in helping conspecifics, depending on their needs, Yamamoto et al. (2012) developed an experimental paradigm, in which the subjects were tested in dyad in two different conditions, a first "can see" condition, a "cannot see" condition and a second "can see" condition. To help a conspecific to solve the task to get a juice reward, the subjects had to select and transfer an adequate tool to their conspecific partner. A stick-use and a straw-use situation were set up and seven objects, including the stick and the straw were placed on a tray. In the adjoining booth, the recipient could not directly reach the presented tools. By poking the arm through a hole in the panel, which separated the room, the recipient could do a request. The main difference to previous studies exploring cognitive mechanism based on chimpanzees helping behavior is the fact that the helper had to choose between seven potential tools to help his partner accomplish the task and get a reward. Further they designed the study with two different conditions, allowing the helper to see, respectively to not see the tool use of the conspecific partner. The subject got training to resolve both of the tool-use tasks, without any shaping of behavior from experimenter. Further the chimpanzees could communicate with each other, without any artificial medium of communication, i.e., symbols, in order to prevent the possible establishment of standard fading, shaping, chaining and discrimination procedures and performances. In the "can see" condition over 90% of the trials, in which the helper could see the conspecifics tool use throughout a transparent panel, at least one object, if it was a tool or a nontool object, was provided by the helper. In a pre-test phase, when no tool-use was needed and the chimpanzees just got familiar with the objects presented, in only 5% of the trials objects were offered. Hence, it is suggested that the offer of objects only occurred according to the request of the recipient. An offer upon request was considered in 90% of all offers. Further, in the first tool offer, they significantly offered more often the stick or straw tool, in contrast to nontool objects. Limiting the tools to stick and straw tools, helpers more often selected the stick in the stick-use situation and the straw in the straw-use situation. These findings led to the statement, that chimpanzee's targeted helping depended on the dilemma in which his conspecific partner found himself. In contrast, in the "cannot see" condition, the panel was opaque, in order to investigate if and how chimpanzees were able to understand which tool their conspecific partners required. To see the tool-use situation, the helper had either to stand up or have a look through a hole. This time, over 95% of the trials, regardless if it was a tool or nontool, they continued to help by offering at least one object. The upon-request of this condition, with offers of an average of over 70%, again out weighted the offers made voluntary by the

helper. The main difference between these conditions occurred in the examination of which tool the helper offered first compared with the two tool-use situation in the partner's booth. In the "cannot see" condition the significant difference in providing the stick or straw depending on the recipients dilemma, disappeared. The helpers failed in providing the appropriate tool needed, when they did not visually evaluate the tool-use situation of their partners. Therefore, even if the initiation of chimpanzees' helping behavior is based on the request behavior of conspecifics, it is not enough for effective targeted helping. In order to confirm the significant findings in the "can see" condition versus the non-significant findings in the "cannot see" condition and to show that the results are not due to the experimental order, a second "can see" condition was set up, with almost the same outcome as in the first "can see" condition. Hence, in chimpanzees, flexible targeted helping and the understanding of the tool, needed by their partner, can be confirmed when they visually can assess the situation of the conspecific partner.

Human and non-human primates show a broad range of similarities among the helping paradigm, showing strong prosocial behavior in different settings, as well as similar mechanism underlying these abilities. Even if chimpanzees, like human children are able to help in a variety of ways in cooperative and collaborative interactions, there are still differences and up to date, nothing is known about the motivational factors affecting prosocial behavior in chimpanzees. The question is what motivates such other-oriented behavior.

Current study

The aim of the current study is based on recent studies with children, to explore helping behavior in chimpanzees and ask the question if chimpanzees help paternalistically. The current design was adapted freom studies by Yamamoto et al (2012) and by Martin and Olsen (2013), which investigated the flexibility of chimpanzees' and childrens' helping behavior, respectively. In the current study two tube tools, one relevant the other irrelevant, were placed on an apparatus between two chimpanzees facing each other in separate booths. One chimpanzee (the subject) could provide one of the tools for the conspecific (the stooge), by pressing a lever. The stooge was trained to reach for the irrelevant tool. Importantly, his view was obstructed by an occluder, such that he could see only parts of the objects that looked identical to him. Therefore, from the subject's point of view the stooge could not see the better option.

The study was designed as a between-subject experiment in an ABA design, e.g., control plus test condition plus control condition. In the test condition the stooge needed the relevant tool to retrieve juice from a separate box. In the control condition there was no box and therefore the type of tool did not matter. Each individual subject underwent a training, a pretest and a test phase. The question was whether the subject would provide the tool the stooge was reaching for or whether the subject would help paternalistically by correcting the stooge and providing the relevant tool. The hypothesis was that this should be more often the case in the test condition, i.e., when the tool mattered for the stooge, compared to the control condition.

Method

Participants

Participants of this study were 11 socially housed chimpanzees, 9 in the subject role and 2 in the stooge role. The participants live in a stable chimpanzee group called A-group. All of the tested chimpanzees were born in captivity and are housed at the Wolfgang Köhler Primate Research Center at the Zoo in Leipzig. Based on time issues and for several other reasons, 5 of the individuals only passed the pre-training level and provisionally were excluded for the current study.

The tested chimpanzees all belong to the subspecies Western Chimpanzee, called Pan troglodytes versus, except for Riet, Sandra and Taï who are hybrids of Western and Eastern Chimpanzee called Pan troglodytes schweinfurthii. The subjects who participated were Robert and Lome as stooges and Kofi, Kara, Lobo, Taï, Sandra, Fraukje, Ulla, Riet and Natascha as subjects. Because of time issues to ensure the timely submission of the thesis, Swela, Corrie, Bangolo, Kisha and Quamisha only passed the training procedure, which for some individuals only consisted in a warm-up phase (see Tab. 1).

All individuals live in a semi-natural habitat. They spend most of their time in large indoor or outdoor enclosures. In both enclosures, one can find many different climbing options, artificial termite hills, water dispensers, artificial water streams and a variety of enrichment boxes. The chimpanzees are provided with a separate retreat, sleeping and observation rooms. In sum, the chimpanzees from the A-group have a living environment of 4533 m^2. Furthermore, all subjects participate voluntarily in the studies and are never food or water

deprived. Research is conducted in the sleeping and/or observation rooms. All rewards that the chimpanzees get for their participation in studies are additional to their usual daily diet. Subjects in this study are only chimpanzees, no other great ape species is tested in the framework of this thesis.

The chimpanzees are threatened according to the global strategies of the European Endangered Species Program (EEP). In accordance with the recommendations of the Weatherall report "The use of non-human primates in research", no medical, toxicological or neurobiological research of any kind is conducted at the Wolfgang Köhler Primate Research Center. Research is always non-invasive and strictly adhered to the legal requirements of Germany. The chimpanzees are fed tree times a day with a broad range of fruits, vegetables, cooked meat and cereals. In the wild chimpanzee usually have to search for their food. Therefore, every day the chimpanzees are provided with additional enrichment feeding.

Table 1: Information about names, sex, age, group and role of the chimpanzees participating in the study

Subject	Sex	Age (in years)	Group	Role	Data status
Robert	male	39	A	stooge	test session
Lome	male	13	A	stooge	test session
Kofi	male	9	A	subject	test session
Kara	female	9	A	subject	test session
Lobo	male	10	A	subject	test session
Taï	female	12	A	subject	test session
Sandra	female	21	A	subject	test session
Fraukje	female	38	A	subject	test session
Ulla	female	37	A	subject	test session
Riet	female	37	A	subject	test session
Natascha	female	34	A	subject	test session
Swela	female	19	A	subject	warm-up
Corrie	female	38	A	subject	warm-up
Bangolo	male	5	A	subject	warm-up
Kisha	female	10	A	subject	warm-up
Quamisha	female	21	A	subject	warm-up

Facilities

Both for training and for testing, the chimpanzees were either in the observation or in the sleeping room. For the training they were tested separately, in some cases other chimpanzees were in the spaces nearby. The chimpanzees entered the observation or the sleeping room directly from the indoor enclosure, where they usually spend the mornings during the testing times or via a tunnel system, when they already have been tested for another study. Usually the training and the testing took place between 8:30am and 12:30am. Drawings of the observation and the sleeping room of the chimpanzee A group are given in Fig. 1 and 2. In

this study the relevant spaces in the observation room are space 2 and 3 and for the sleeping room 3 and 4.
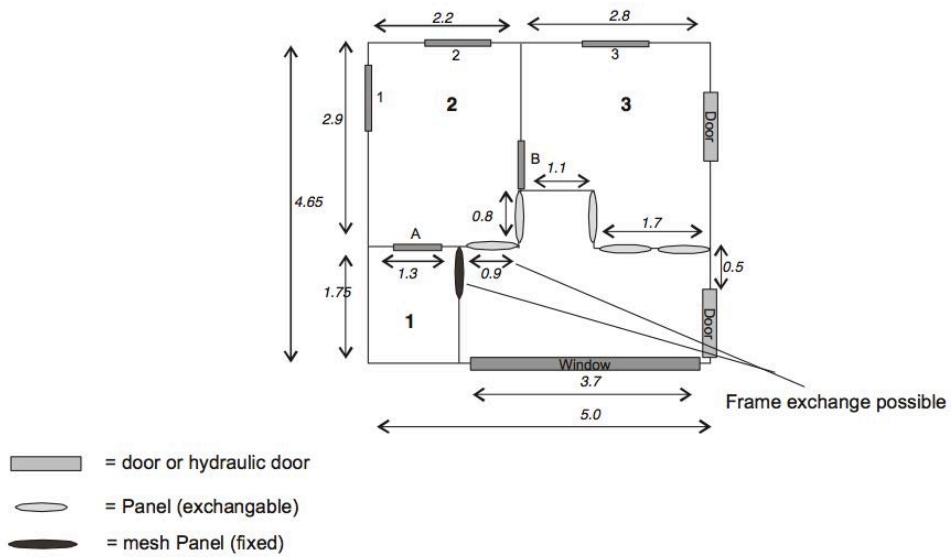

Figure 1: Observation room of the A chimpanzee group
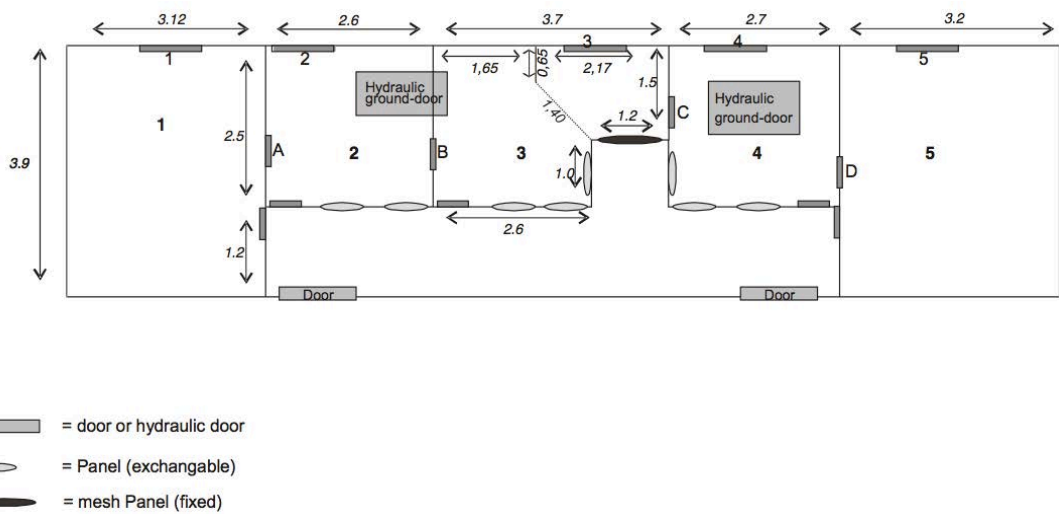
Figure 2: Sleeping room of the A chimpanzee group

Apparatus and experimental setup

To investigate the helping behavior of the chimpanzees, the subjects were tested in dyad and in a test condition and a control condition, according the ABA design. Every chimpanzee performed twice the test condition twice on two testing days. First with one stooge and then the stooges switched and again subjects got two sessions with the switched stooge.

Relevant and irrelevant tools were placed on the left or right side of the apparatus (counter-balanced; see Fig. 3).
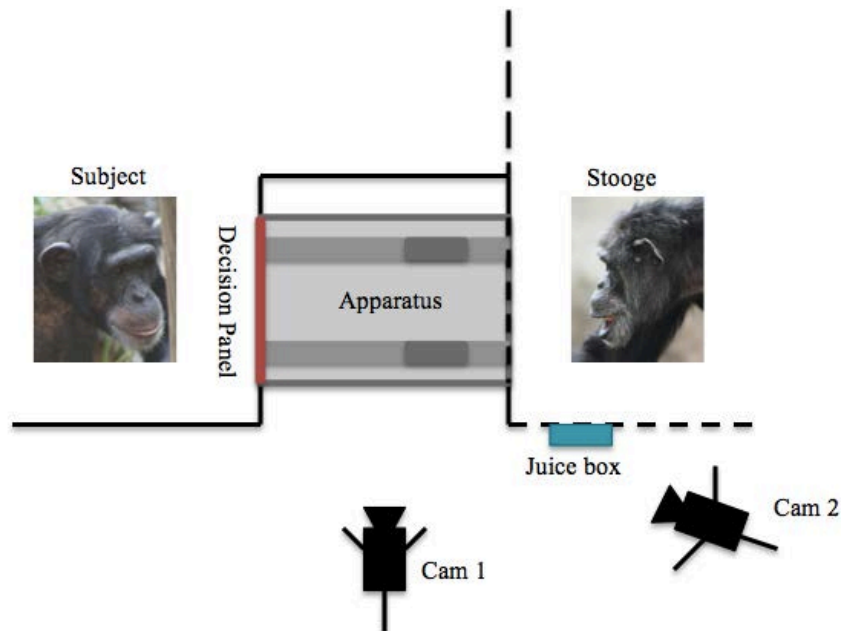
Figure 3: Schematic drawing of the experimental setup and the camera position for the test sessions

The experimenter remained in the testing room for the entire session. Two cameras, Cam1 and Cam2, were fixed on top of tripods that were placed outside the booth, providing a full image of the experimental situation. One right in front of the booth, filming both chimpanzees, the other one left of the stooge booth, providing a frontal image of the subject during the sessions (see Fig. 4 and 5).

Figure 4 (left): Snapshot providing the view of the recorded material from Cam1 = camera in front of booth;

Figure 5 (right): Snapshot providing the view of the recorded material from Cam2 = camera on the left side of stooge outside his booth

To make sure that the subject always saw the reach of the stooge, every trial began by removing a fixing nail on the decision panel (on the subject's side) by the experimenter, when both individuals sat facing each other. If the subject did not provide a tool for one minute after the nail had been removed, the next trial was started. A test session consisted of sixteen trials (four control trials, eight test trials and four control trials; see Tab. 2 and 3).

The apparatus was placed in the booth on two metallic tables, each fixed outside the panel or mesh of the chimpanzees' testing space. For the stooge, a removable juice box was attached on the mesh on the right side around the corner. The juice box was only in place during the weak test condition. The juice box was removed for the control conditions. The glass front in the both above the mesh and the panel was occluded with big magnetic blinds. Additionally, to put the pellets in the container and during the process of drinking the juice out of the juice box of the stooge, the view from the subject's side was occluded with a black occluder placed in front of the decision panel.

The trial started, when stooge and subject were sitting facing each other. The opaque occluder on the stooge's side was removed and the time was recorded. If after one minute the stooge did not perform a reach, the next trial was started. If there was a reach and the experimenter could assume that the subject had seen the reach, the fixing nail on the decision panel on the subject's side was removed and the time was recorded again. As soon as the experimenter took out the fixing nail from the decision panel on the subject side, the subject could either move the ripped Plexiglas in the left or right holes of the decision panel. After the

ripped surface was moved, another nail fell down, which made it impossible to move the surface back to the other side (see Fig. 12).

By moving and opening one side of the decision panel, the subject got free access to the apparatus, and by pressing the lever with the fingers, providing the tool to the stooge. If the subject provided a tool, the experimenter noted which tool was provided and the next trial was started (see Fig. 6).

Figure 6: Snapshot of one of the subject (Kofi) providing a tool to the stooge

For the test condition, the juice box was visible fixed on the left mesh on the stooges' booth, after the experimenter showed the box to both of the chimpanzees. This was done to ensure, that the subject realized, that the stooge chimp would need the relevant tool to get the juice out of the juice box.

In order to make sure that the subject realized, that even if the stooge reached for a tool, it did not matter which tool they provided, because there was no juice box hanging on the stooge mesh. In the first control condition the juice box was showed to the chimpanzees and then put on the floor, visible for both. In the second control condition, after the test condition, the juice box was visibly removed from the mesh and placed on the floor.

From training sessions, the subjects had the experience with the juice box, such that they learned that only the relevant tool was working to drink juice from the juice box. For the stooge training a different juice box was used. This box could be operated with both the short and the long tube that is with both the relevant and the irrelevant tool (see Fig. 7 and 8).

Figure 7 (left): Snapshot from one subject (Riet) while drinking juice out of the box only working with the relevant tool; Figure 8 (right): Snapshot from one stooge (Robert) drinking juice out of the box working for both tools

To keep the subjects motivated in the test, they each got a pellet reward 1 minute after the stooge's reach whether they provided a tool or not. Even if the stooge didn't make a reach, 1 minute after the trial finished, subjects got a pellet. The stooges always got juice, in the test condition, as well as in the control conditions, whether they made a reach or not and irrespective of whether the subject provided a tool or not. In order to prevent the possibility, that the subjects got confused by the stooge's drinking noises, especially if he/she provided the irrelevant tool, in the control conditions, the stooge got the juice from a syringe directly into the mouth from the experimenter. Additionally, when the experimenter put the pellets in the buckets beneath the irrelevant tool, some noise was made with the tool occluder to minimize the possibility that the subjects could hear that the stooge was reaching for pellets.

Design

The current empirical study investigated chimpanzees' (Pan troglodytes) paternalistic helping behavior. The aim of the study was to explore factors affecting such helping behavior in chimpanzees. More specifically, the question was whether subjects would significantly correct their conspecifics and therefore help paternalistically.

The study was based in an ABA design, with a test condition being preceded ans followed by a control condition. A control condition consisted of 4 trials, a test condition con-

sisted of 8 trials. On every trial the subject sat facing the stooge. The procedure for all experimental conditions was the following: In the test condition, but not in the control condition, a juice box was provided for the stooge. On every trial both, the relevant and the irrelevant tool (a short tube) were provided such that the stooge could reach for, but could not access them by his own. In addition in every test session there was an occluder on top of the tools so that from the stooge's perspective the two tools looked identical. Furthermore, the stooge chimpanzee was trained to reach for pellets, located beside the tools and not visible for the subject chimpanzee. Importantly the pellets were always located on the side of the irrelevant tool to make sure that the stooge, in the majority of cases, reached for the 'incorrect' option. This created a situation in which only the subject chimpanzee saw the location of the relevant tool. The subject chimpanzees had the choice to provide either the relevant or the irrelevant tool for the stooge. If the subjects helped to complete the reach they would provide the irrelevant tool. Helping paternalistically meant correcting the stooge by providing the relevant tool he did not reach for.

Data collection for this study took place between February 2014 and May 2014 at the Wolfgang Köhler Primate Research Center (WKPRC) of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, located at the Zoo in Leipzig, Germany.

The current study was approved by the internal ethical committee from the Max Planck Institute for Evolutionary Anthropology, as well as from the professors and directors of the Wolfgang Köhler Primate Research Center and the Max Planck Institute of Evolutionary Anthropology and the zookeepers.

Procedure

For the study we had two roles, the stooge role and the subject role. Two stooge chimpanzees were chosen before the beginning of the study. Robert, because he was the oldest one and most of the chimpanzees get along with him. The other one, Lome, is the second in the hierarchy and also gets along with most of his group members. All the remaining chimpanzees became subject chimpanzees. Both stooges were tested with each of the subjects participating in the study.

In order to always get a reach after the irrelevant tool by the stooge, creating the situation to investigate if the subjects acted paternalistically, pellets were placed in two little fixed containers, each next to the placed tools. From the subject's point of view the containers were

occluded and they could not see when the pellets were put in or lying there during the testing (see Fig. 9).
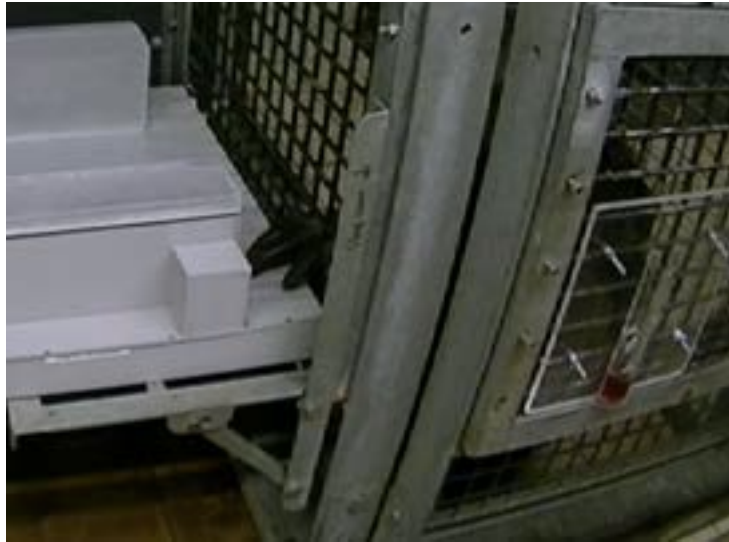

Figure 9: Snapshot of the stooges' reach through the mesh with the grey buckets nearby containing pellets

Before the training, which preceded the test, all stooges and subjects started with a warm-up. In this phase the chimpanzees could simply experience the tools and the juice box without counting trials. This was in order to make sure, that they did not have any striking difficulties or that they were afraid of any object, which could have influenced the further procedure. As soon as they got familiar with the presented objects, which mostly occurred very fast, the training procedure started (see Fig. 10 an 11) .
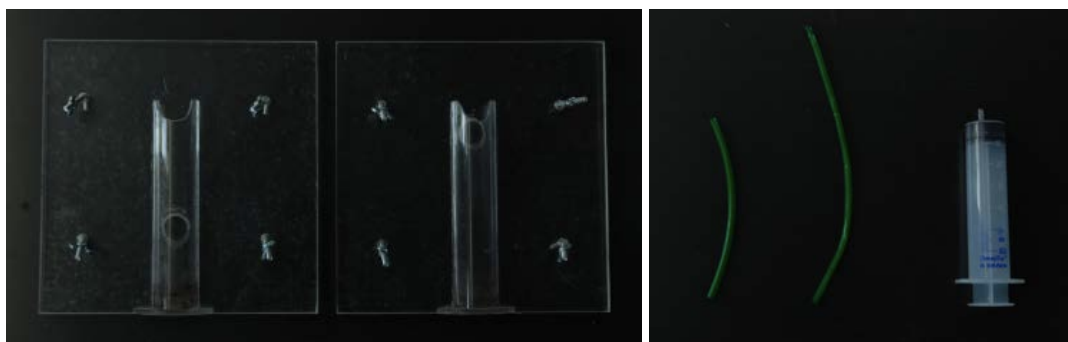

Figure 10 (left): Snapshot of the juice boxes used in this study (stooges' box left, working for both tools; subjects' box right, working only for relevant tool); Figure 11 (right): Short, irrelevant tool (left), long, relevant tool (right) and syringe for giving the juice to the stooge during the control condition in the test sessions

Figure 12: Snapshot of the decision panel with the ripped Plexiglas to press the apparatus with the fingers

Stooges

First training phase: The stooge chimpanzees were trained to use a relevant, long tube tool and an irrelevant, short tube tool to drink juice out of a juice box. This phase had no specific criterion. The main aspect of this phase, split in three parts, was to see if they were capable of using the tools and of drinking juice out of the juice box. By showing them the mechanism they learned with and from the experimenter how the tools worked. Additionally they were trained to make a reach through the mesh, reaching after pellets placed beside the irrelevant tool in a little bucket nearby. This training session had two passages with each 8 trials. The criterion was 6 of 8 correct reaches after the pellets in one session to pass to the next session. To keep them motivated to reach after the pellets, in every session, after the 4th trial, the stooges got the pellets (one for every trial).

In the next phase, the stooges experienced the same procedure with 8 trials, but this time with the tools on a sliding table in outside of their booth. There was no criterion and again they got rewarded with one pellet after every 4th trial. Next, pellets were placed with the tools on the sliding table. Goal of this phase was, that the stooges reached for the pellets, even if there were tools lying on the table. The pellets had to become more important than the tools to make sure that in the test condition, they would show no preference for either the relevant or the irrelevant tool. First the side of the tools was switched after every trial, but to run out any side bias, with the beginning of the training with Lome, the tools were placed randomly, using R output.

Second training phase: This phase was split in three parts. First the stooges had to reach after the tools for 4 trials. Then 8 trials they made the reach after the pellets and next, again 4 trials with reach after tools. After every 4th trials the stooges get their pellet reward, no criterion. The aim of this session type was that the stooges learn to reach after pellets placed in the bucket beside the irrelevant tool, in order to clearly see, if in the test, the subjects provides the tool after the stooge reaches for or if he acts paternalistically and provides the relevant tool, which he learned works to drink the juice.

Third training phase: This training session was a modification and extension of the previous training phase. The pellets and tools were placed randomly in the apparatus. Randomization was made with the statistic program "R", for sessions with 4 and sessions with 8 trials. In 8 trials the stooges now had to reach after the pellets, whatever the tool nearby. The experimenter pressed the tool, after the stooges reached for. Because for the stooge both tool worked to drink the juice, they then could drink the juice out of the juice box with the tool. The main point of this session was to make sure, that the stooge doesn't pay attention of the tools or show some preference by choosing and reaching after the relevant or irrelevant tool, but that they only focus on the pellets, which, in the test phase, were placed beside the irrelevant tool in the apparatus and was not visible for the subject chimpanzees.

Subjects

First training phase: The subject chimpanzees had a similar training for the tools as the stooge chimpanzees. The main difference was that only the relevant, respectively the long tool worked with the juice box. Therefore, they had to learn to distinguish the relevant from the irrelevant tool. In this session, the subjects chose one of the tools, making a reach with their fingers through the mesh. Each subject had 6 sessions with 8 trials. 6 of 8 trials had to be correct, i.e. reaching for the relevant, long tool. Hence, if the 6 of 8 trials did not succeed, they got another 6 sessions, again each session with 8 trials. If the subjects didn't get 6 of 8 trials correctly after 12 sessions, they were running out of the study. The training took place either in the sleeping room or in the observation room, according to the availability of the rooms.

Second training phase: In this training phase, the subjects got familiar with the apparatus. Each subject got 8 trials with no criterion. The tools were places randomly. They had to reach after a tool and the experimenter provided the tool by pressing the apparatus.

Third training phase: The aim of this session was that the subjects chimpanzees experienced the mechanism of the apparatus and learned to use it by themselves. The session was split in 4 short sessions with 4 trials. There was no criterion set for this phase of the training. The goal was to expose them to both sides of the adjacent booth, respectively, that they experienced what's on the stooge side and what's his point of view of the situation.

Fourth training phase: This training session had 8 trials and no criterion. Again, the sliding door remained open for the whole session, allowing the subjects to perceive both sides of the experimental setup. They learned to provide the tool by themselves without occluder on top of the tools.

Fifth training phase: In a session with 8 trials the subjects got again got pre-test training with the sliding door open and with the decision panel on the subject side. The subjects again got familiar with both sides of the apparatus, they got the view of the tools from both sides, with occluder on top of the tools, which is the main difference between this session and the fourth training phase. And again, they trained to use the decision panel to get access to the apparatus in order to provide the tool by themselves. This session was repeated twice for every subject.

Dyads

Pre-Test: In order to investigate if the chimpanzees help at all, they got each 3 pre-test session with 8 trials in dyads. The tools were replaced by one randomly positioned wooden stick. The criterion was at least one time providing the stick to the stooge in each session. The session was repeated 3 times with decision panel in the booth of the subject chimpanzee. One of the subject (Fraukje) didn't provide any stick to the stooge during the 3 sessions with Lome. Another subject, Ulla, with Robert as stooge, didn't provide the stick either, but at least she pressed the side providing no tool. Because the aim of this session was to expose all of the subjects to the same condition, namely to make, sure that they are able to provide

something to a conspecific partner, even if the criterion was not achieved for all subjects, they all passed to the further lever after 3 sessions.

Test: For the testing a weak paternalism condition with a control condition was developed. In the weak paternalism condition the tools were occluded, not allowing the stooge chimpanzees to see if their reach was for the relevant or irrelevant tool. At the same time, because they were trained to do the pellet reach, the reach was manipulated, so that the stooge chimpanzee always reached after the irrelevant tool. The subject chimpanzees always saw the full length of the tools, even if the tools were occluded, and they could provide the tool by pressing a mechanism out of a decision window in a Plexiglas panel.

The dyads, each a stooge chimpanzee and a subject chimpanzee were tested either in their sleeping room or in the observation room. Both times they sat opposite each other, separate with a mesh, a sliding door and a booth between them. The apparatus was placed in the booth, allowing the stooge chimpanzees to show the reach with their fingers and pressing to provide the tools for the subject chimpanzees. Before every training the chimpanzees had a pre-training to find out if they can drink out of a tube at all and if not, they got some pre-training until they were able to do so.

Table 2: Conditions and trials for stooges

Procedure	Type	Trials	Sessions in sum (one per day)
Pre-training	Warm-up	---	---
Training ABA	1_2_1	8x4x8	1x
Training BAB	3_4_3	4x8x4	1x
Training	5	8	1x
Pre-test (in dyad)	6	8	3x
Test weak paternalism condition ABA	1 2	8x4x8 8x4x8	2x 2x

Table 3: Conditions and trials for subjects

Procedure	Type	Trials	Sessions in sum (one per day)
Pre-training	Warm-up	---	---
Training ABA	1 2 3 4	8 8 4 8	1x 1x 3x 1x
Pre-test (in dyad)	6	8	3x
Pre-test (alone)	7	8	2x
Test weak paternalism condition ABA	1 2	8x4x8 8x4x8	2x 2x

Data coding

The participant's behaviors and interactions were recorded on video, one camera for the training sessions and two for the test sessions. One camera was positioned in front of the booth ensuring the filming of both the stooge and the subject chimpanzees. The second camera was placed outside on the left side of the stooge to capture the front view of the subject chimpanzees. The coding was the same for the training as if it was for the test condition. The behavior was coded live during the session on the coding sheets. Afterward, the data was entered into EXCEL sheet. '1_1' was coded, if the stooge reached for the irrelevant tool and if the subjects corrected him by providing him the relevant tool. If the stooge reached for the irrelevant tool and the subject did not correct him and provided him the irrelevant tool '1_0' was coded. Therefore, if the stooge reached for the false, relevant tool and the subject provided the relevant want, then '0_1' coded. And if the stooge reached for the relevant tool and the subject provided him the irrelevant one, '0_0' was coded. If somehow the stooge made the reach, but the subject did not respond by providing a tool, then just '1' or '0' was coded. 1 if he reached for the irrelevant one and 0 if he reached for the relevant one. In case the stooge and the subject didn't show any of an action during 1 minute it was coded as n.a. (= not available). The coding procedure was the same for all the sessions, including the training phases. With the only difference, that when they performed alone, it was either '1' or '0', no pairs of numbers with underscore. The trials were coded live during the training or the test

situation and provided with notes consisting special happenings or help by the experimenter, followed by coding transfer into a excel file.

Results

The following analyses show the results of nine tested chimpanzees. Three of them, Riet, Natascha, and Fraukje, did not provide a tool for the stooge on any test trial. Analyses were run with the R-package (R 3.0.2) using one-tailed Wilcoxon-exact-paired-test provided by the package *exactRankTests* (Hothorn & Hornik, 2013).

Preliminary analyses

General rate of manipulating the apparatus: As a preliminary analysis it was investigated whether there was a difference in subjects' rate of pushing a tool over for the stooge between the control and the test condition. Therefore, the dependent measure was the proportion of trials on which the subject manipulated the apparatus (and provided a tool for the stooge). Furthermore, the data were aggregated in the following way. For each subject and per session across the two stooges the median of the four control conditions (two per stooge during one session given the ABA design) and the median of the two test conditions (one per stooge) was calculated. This provided the estimates of subject's rate of pushing for both conditions for each session individually. In addition, the two session estimates for both conditions were averaged such that the average rate of pushing across the two sessions for each condition was obtained. In short, the first aggregation was within a session but across stooges and the second aggregation was across session. Therefore, each subject provided two data points; the average rate of pushing for both the control and the test condition. Subjects manipulated the apparatus equally often in the control condition ($M = .48$, $SD = .46$) and in the experimental condition ($M = .47$, $SD = .43$), one-tailed Wilcoxon-exact-paired-test $T = 6.5$, $p = .63$ (see Fig. 13). This suggested that subjects were equally motivated in both conditions. Three participants, Riet, Natascha, and Fraukje, did not provide a tool for the stooge on any test trial.
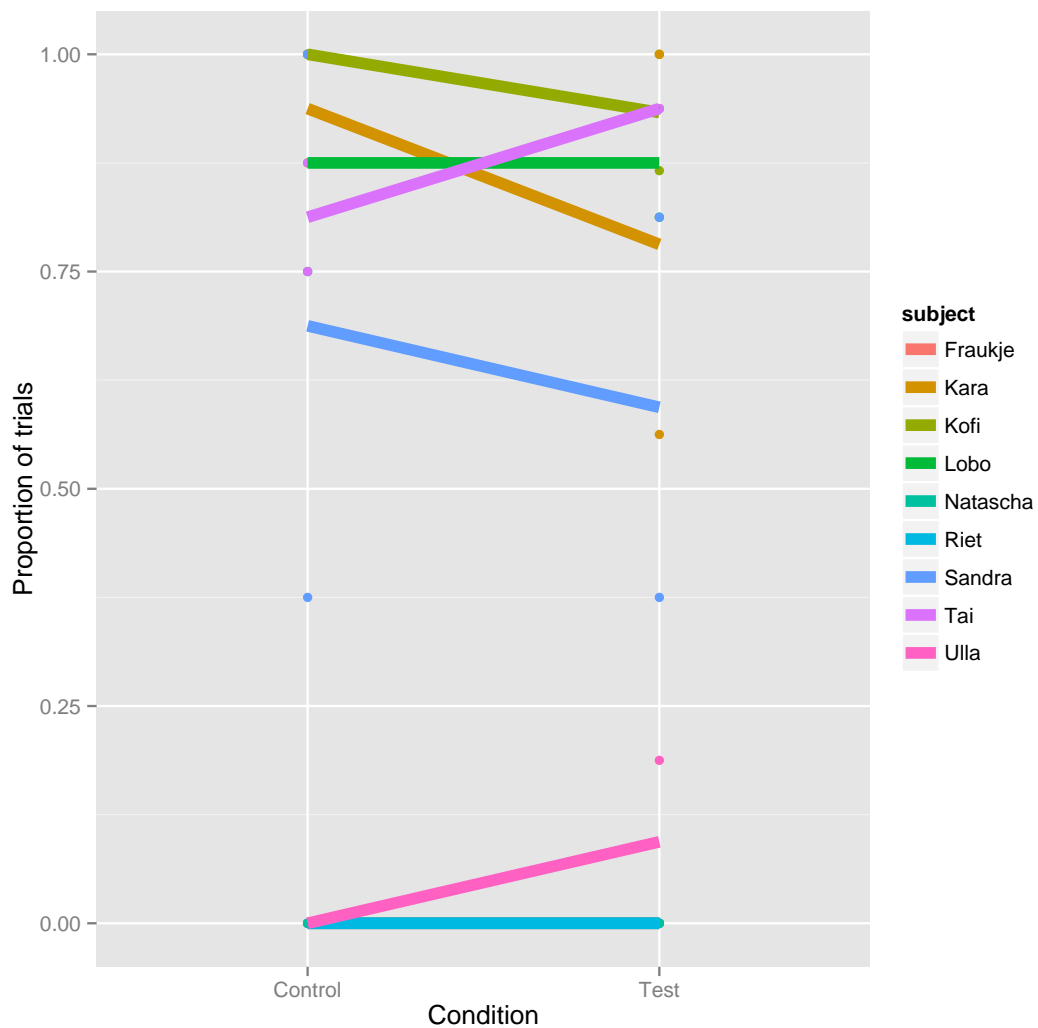
Figure 13: General rate of manipulating the apparatus

Analysis

General rate of providing both types of tools: In a subsequent step, it was investigated whether there was an effect of condition on subjects' motivation to provide the relevant tool for the stooge. The dependent measure was the proportion of trials on which a subject provided not any but the relevant tool specifically. Data aggregation was identical to the above analysis. Subjects provided the relevant tool equally often in the control condition ($M = .23$, $SD = .23$) and in the experimental condition ($M = .25$, $SD = .25$), one-tailed $T = 6.5$, $p = .38$ (see Fig. 14). This suggested that subjects were equally motivated to provide the relevant tool in both conditions. The same analysis was carried out for the proportion of trials on which subjects provided the irrelevant tool for the stooge. Across all session, subjects pushed over the irrelevant tool more often in the test condition ($M = .25$, $SD = .25$) compared to the con-

trol condition ($M = .19$, $SD = .18$), one-tailed $T = 10$, $p = .06$ (see Fig. 15). Subjects were
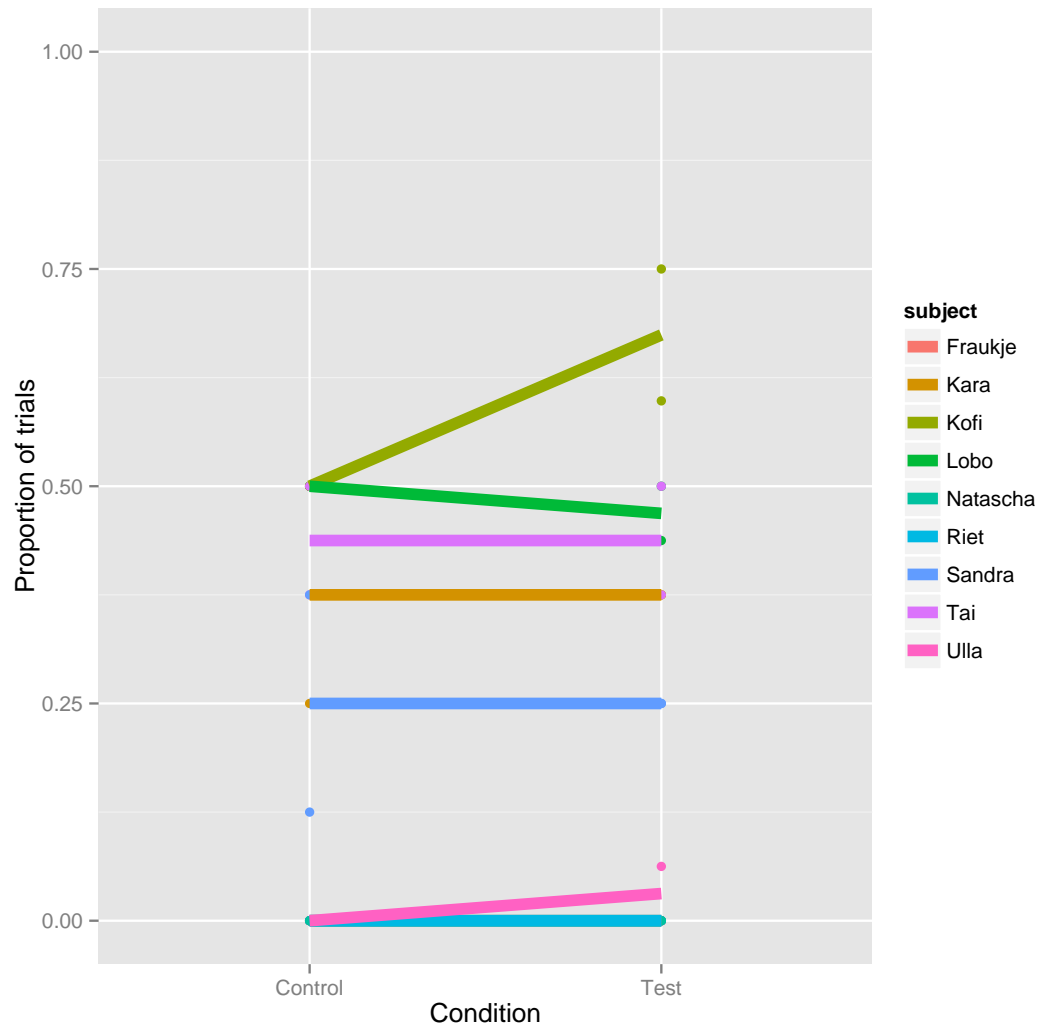more motivated to provide the irrelevant tool in the test compared to the control condition.

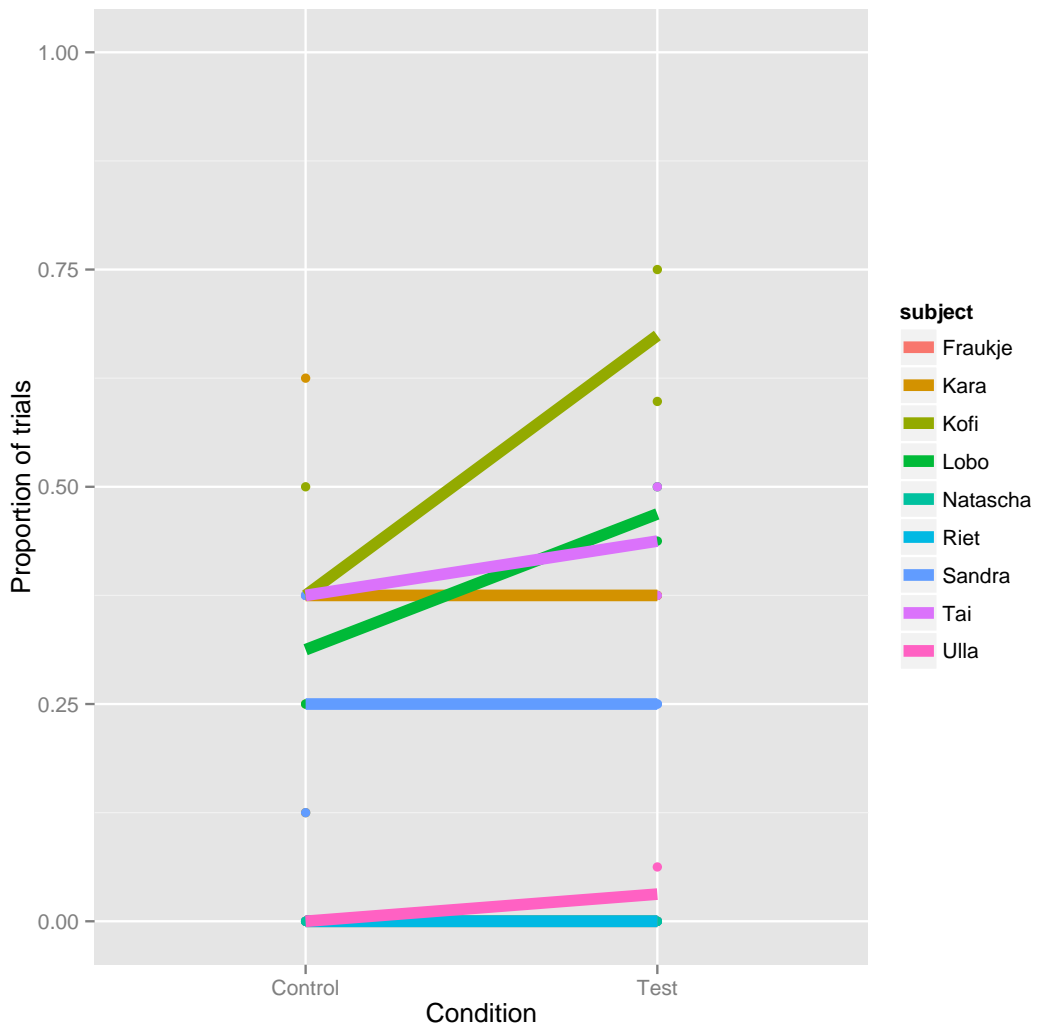Figure 14: General rate of providing the relevant tool

Figure 15: General rate of providing the irrelevant tool

Together, these preliminary analyses indicate that (1) subjects were equally motivated to provide any tool in both conditions, (2) they did not have a preference for providing the relevant tool in both conditions even though they were more familiar with it through the previous training phase, (3) subjects did distinguish between conditions through pushing over the irrelevant tool more often in the test compared to the control condition.

General rate of correcting the stooge's request for help: To investigate whether subjects helped the stooge by correcting his reach to the irrelevant object through providing him with the relevant tool, the rate of subjects' corrective responses during both conditions was analyzed. For this purpose, the three subjects who never provided a tool were excluded from the analysis. In addition, sessions were excluded if the subject was not motivated to manipu-

late the apparatus on two consecutive conditions in the ABA-design. Data aggregation was identical to the above analyses. The dependent measure was not the proportion of trials but rather a proportion score of the number of trials in which the subject provided the relevant tool (and corrected the stooge) divided by the total number of trials on which a tool was provided at all. Therefore, if a subject corrected the stooge on all trials she got a proportion score of '1'. If no tool was provided on any trial and if only the irrelevant tool was provided the score was '0'. Overall, subjects corrected the stooge more often in the test ($M = .4$, $SD = .25$) compared to the control condition ($M = .49$, $SD = .13$), one-tailed $T = 18$, $p = .08$ (see Fig. 16).
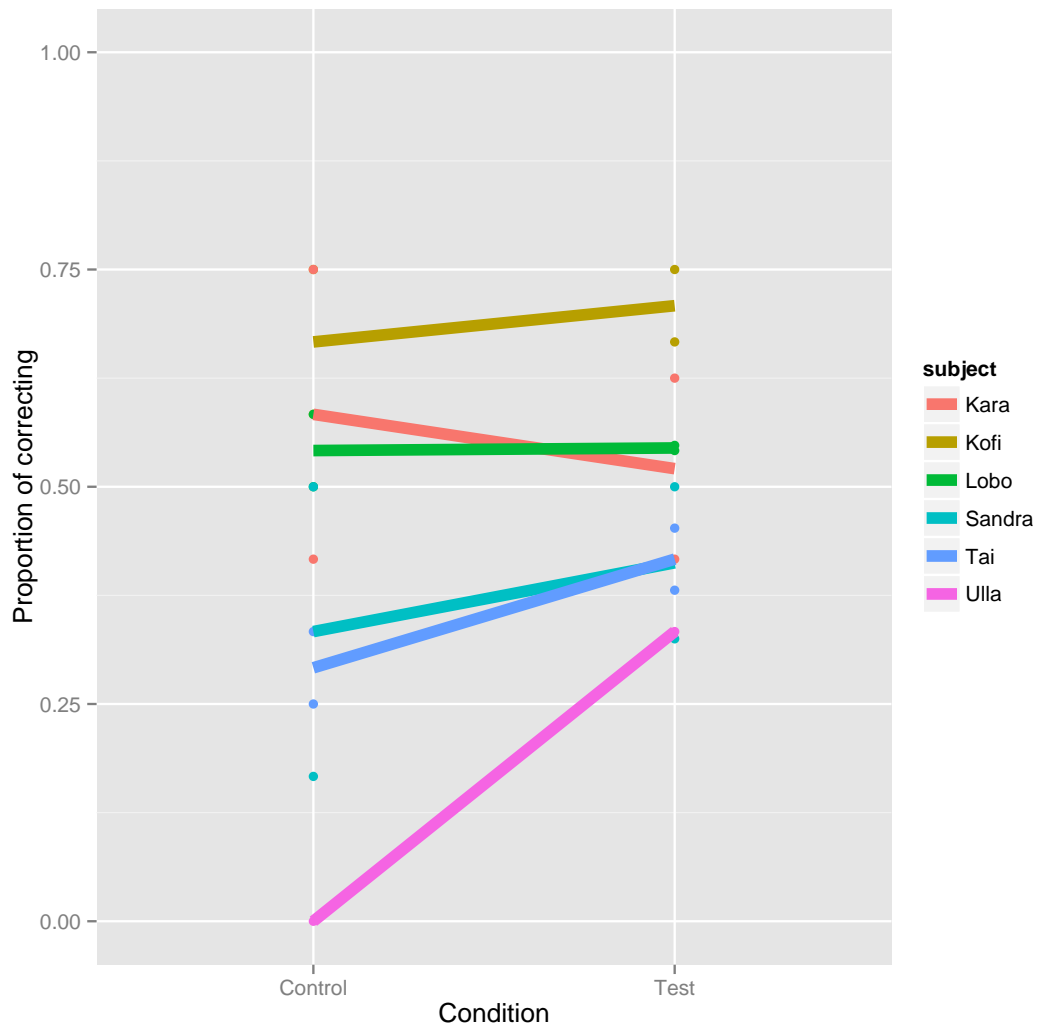

Figure 16: General rate of correcting the stooge's request for help, overall

In addition, the same analysis was carried out for each trial separately. In the first test session, the difference in subject's corrective response between conditions was similar to the overall analysis, though the effect was weaker, with higher rates of correcting in the test ($M = .5$, $SD = .13$) compared to the control condition ($M = .38$, $SD = .28$), one-tailed $T = 17$, $p = .11$ (see Fig. 17). In addition, in the second test session subjects corrected the stooge equally often in the control ($M = .5$, $SD = .19$) and test condition ($M = .5$, $SD = .16$), one-tailed $T = 5$, $p = .56$ (see Fig. 18).
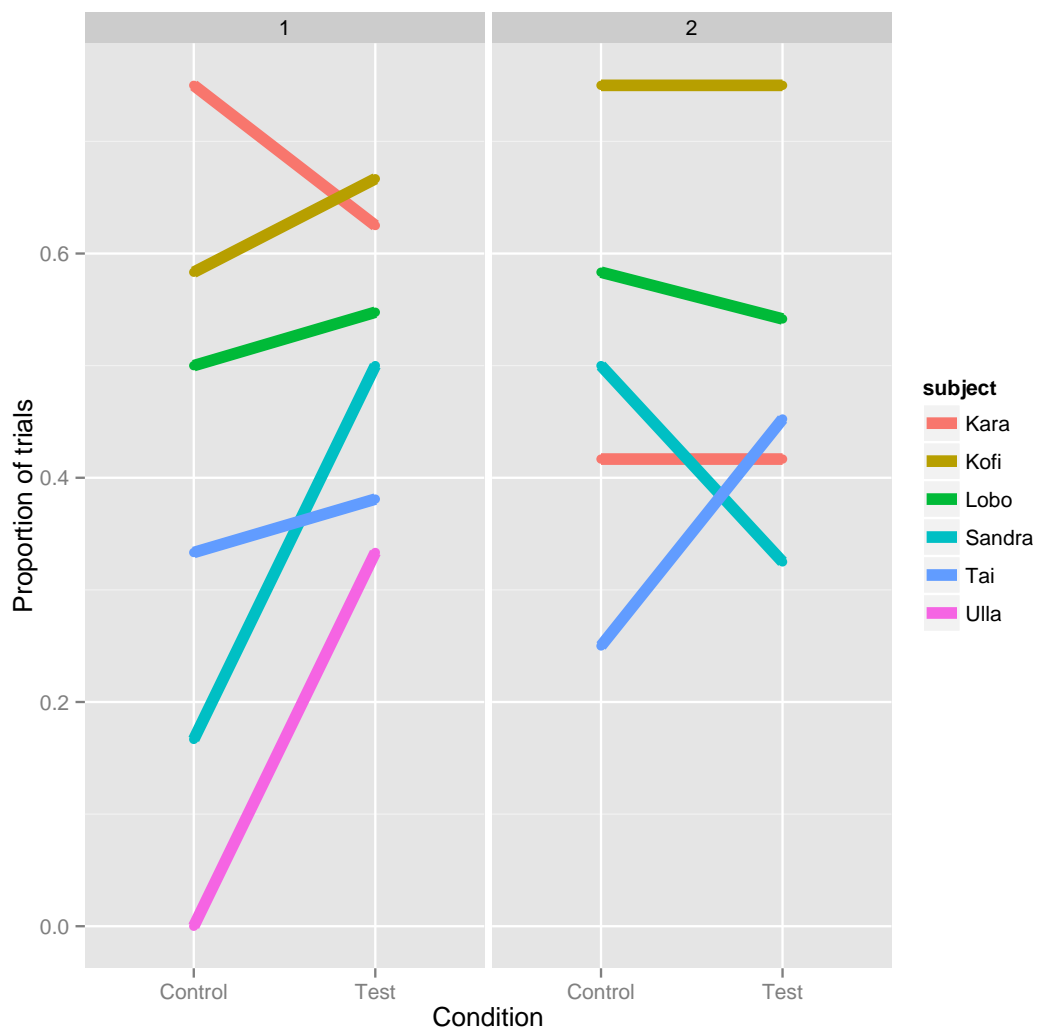

Figure 17 and 18: General rate of correcting the stooge's request for help, session 1 and session 2

Discussion

Based on research investigating helping behavior in young children and the debate of the degree in which such prosocial behavior is unique to humans, the current study investigated helping behavior in chimpanzees, human's closest living relatives, to provide further light into the phylogenetic origins of such behavior. The question was, if chimpanzees are able to show concern for others by helping conspecifics in need of a certain object to fulfill their goal and moreover to help paternalistically, when they have the choice of how to help. Of interest were the motives underlying such helping behavior. To explore these questions, in a helping task consisting of a test and a closely matched control condition, nine subjects were tested in dyad, each with two stooges.

To operate the function of the apparatus, including the different tools, several training sessions took place before the test situation. For each individual data was collected in the training and in the test phases. The test was constructed according to the ABA design, including four control, eight test and again four control conditions for one session. All tested subjects performed two sessions in each condition with both stooges. In some training sessions as well as in the test procedure criterions were specified.

The results showed that the tested chimpanzees, except of Riet, Natascha and Fraukje, who did not provide a tool for the stooge on any test trial, manipulated the apparatus equally often in the control condition and in the experimental condition. Furthermore, the tested subjects equally often provided the relevant tool in the control as well as in the test condition, suggesting, that they were equally motivated to provide the relevant tool in both conditions. Moreover, across all sessions, the subjects provided the irrelevant tool more often in the test condition, compared to the control condition. In sum, the tested chimpanzees were equally motivated to provide any tool in both conditions, not having a preference for the relevant tool in any of the conditions. By contrast, they did distinguish between the conditions by providing more often the irrelevant tool in the test condition, compared to the control condition. Interestingly, overall, the tested subjects corrected the stooge more often in the test condition compared to the control condition. A similar effect occurred when separating both sessions for the analysis for the first session. In the second session, the subjects corrected the stooge equally often in both condition.

Moreover, the results showed that in general, the tested chimpanzees did not show a tool preference for the relevant tool, which they learned was working with the juice box, but

clearly showed the ability to distinguish the type of tools. Across all sessions, they even provide more often the irrelevant tool in the test condition. However, the majority of the subjects helped by correcting the stooge more often in the test compared to the control condition, were no tool was need or at least the type of tool was not significant for the stooge.

      This study investigated helping behavior in chimpanzees. The main investigation aspect was, to what extent chimpanzees show such prsocial behavior and whether it is motivated by genuine concern for other's needs. To investigate this question eleven chimpanzees participated in the study, two of them in the stooge role, the remaining nine in the role of the subject. The stooge chimpanzee needed a tool to drink juice out of a juice box. The subject chimpanzees learned in training sessions, that only a long, relevant tool was working for the task. For the stooge the type of the tool was not important, but in the task, he reached, in the most of the time, after the irrelevant tool, because in fact, he learned to reach after pellets positioned near the irrelevant tool. This was never visible for the subject chimpanzee, creating the situation, that the subject had different information about the tools. At that point the subject could either provide the stooge the tool he reached for, namely the irrelevant tool. Or he could help him paternalistically by correcting him and providing him the relevant tool. Each subject was tested twice with both stooges in the weak paternalism condition based on the ABA design consisting four control trials, eight condition trials and again four control trials.

      In the current study, all tested chimpanzees, except for Riet, Natascha and Fraukje, merely showed strong prosocial helping behavior when performing the task with the stooge chimpanzees by correcting them more often in the test condition compared to the control condition, were the type of tool needed was irrelevant. It is suggested that the failure of Riet, Natascha and Fraukje cannot be explained by the fact, that they didn't understand the task or the apparatus, as they all were exposed to the same conditions and they all had to achieve defined criterion at some point of the study. They all experienced the same procedure and showed evidence of appropriate learning and understanding of the mechanism, the apparatus, as well as the task itself. The main point leading to this suggestion is the fact, that trained and tested in the individual sessions, without performing together with the stooge chimpanzees, they fully comprehend the task with all it commodities involved. The missing helping behavior in the test condition can rather be explained by a lack of motivation and willingness to help at all and not by a cognitive disability of helping behavior (see Melis & Tomasello, 2013). Nevertheless, at the end, it cannot be said with clear safety, what exactly caused the

missing helping behavior in these conditions. In general, several reasons could explain the lack of motivation and willingness to provide help to their conspecific partners. Group hierarchy and chimpanzees ages, for instance, could be plausible reasons, what kind of aspects influenced some chimpanzees' behavior in the helping test condition. Both stooges are high ranked member in the group hierarchy. Robert was the former alpha male, before his son Frodo succeeded him. Respected by the whole group and appreciated for his peaceful and gentle character, Robert still has an important role in the group hierarchy. Lome, the second stooge in the study and actually second in the hierarchy and heir apparent, is also accepted as a democratic and gentle group member. Like in humans, according to Tomasello (2008), social norms, reputation and the own role in social contexts, gain in importance with increasing age. This could also partly explain the tendency of younger chimpanzees to help paternalistically, rather than the decreasing helping behavior in the older ones during the test condition. From the aspect of the role of the stooge needing help towards the subject proving help, as well as from the role of the subject in the group, according to their rank based on their ages.

The results of the study clearly demonstrate some evidence of chimpanzees' concern of others. The provided help is not merely motivated to complete action sequences, but actually to respond to others' need. These interesting findings complete previous and similar helping behavior studies in chimpanzees and great apes. In the current study, five of six tested subject chimpanzees corrected the stooge more often in the test condition as in the control condition, when no juice box was visible and therefore, correcting the stooge by providing him the relevant tool was useless. The findings exclude the possible conditioned learning effect of tool preference in this task, since there was no significant statistical evidence found in that term. By contrast, the results show a session effect. The chimpanzees corrected more often in the first test session compared to the second test session, even if they still more often provided the relevant tool compared to the irrelevant tool. It can be suggested that this session effect is the result of a general decrease in motivation to perform further in the task, maybe based on daily mood or due to possible group agitation.

Furthermore, in this study, the chimpanzees helped upon request in a helping task and there is some evidence that they recognized the value of the genuine needed relevant tool of their conspecific partner. This is contrary to the findings and conclusions of the sympathy study of Liebal et al. (2014), arguing that chimpanzees do not help more upon request, in terms of solicitation and against Pelé et al. (2009), hypotizing that they possibly not recognize the value of the token needed by their conspecific partner. Even if we didn't test helping be-

havior regardless of a request, there is some strong evidence, that the chimpanzees complete-ly knew the values of the tool needed by the stooge, as well as the understanding of the reach as a request, which is in turn coherent with the conclusion of Yamamoto et al. (2012). The possible argument of any harassment effect affecting helping behavior in the task cannot be fully ruled out, but there was no observation of any kind of disturbance of the subjects during the task and they never were directly engaged in harassment.

Chimpanzees' helping behavior by providing more often the relevant tool throughout the sessions and additionally when the stooge reached for the irrelevant tool, even if they were not directly rewarded, is a clear sign of their complex cognitive abilities as well as for their ability to understand others needs. Moreover, to respond in a paternalistic way, they cognitively had to be in a position to make the difference between the ultimate goal underly-ing the stooges' request and the immediate request itself. Therefore the subjects had to under-stand the utility, the relevance and the affordance of the objects as well as appropriate means of the goal. In addition, with regard to sympathy and empathy as the main motivational fac-tors underlying prosocial behavior, to act in a paternalistic way, the subjects had to be altruis-tically motivated to help and especially to correct their partner (see Liebal et al., 2014; Martin & Olson, 2013). Being not directly beneficial, such complex prosocial behavior is costly for the actor and is merely seen as a unique human trait. In addition to the findings of Martin and Olson (2013) in their study investigating the ability of young human children's paternalistic helping behavior, the findings of the current study seem to be very promising concerning the same behalf. Interestingly, overall, the majority of the tested chimpanzees in the current study showed paternalistic helping behavior by correcting the stooge more often in the test condi-tion compared to the control condition. Although there is a lot more work to do, to provide more insight in the mechanism and genuine motivation underlying such helping behavior in chimpanzees, it can be suggested that the degree in which it is seen unique in humans, might be less than previously thought and that the phylogenetic roots of such prosocial helping be-havior may run much more deeper than previously assumed.

Limitations

There are some potential limitations of the study. First, the reach after the irrelevant tool from the stooge was suboptimal. To make sure that the subjects really paid attention and fully witnessed the reach of the stooge was not easy to manage. The chimpanzees, if they were not sitting in front of each other before the trials began, were called by name to get their

attention, to initialize the start of the session, and to try to center them in front of the decision panel or the mesh panel. Sometimes, even sitting in front of each other, their gaze was not fully directed towards the stooge. In this study, the experimenter carefully observed both chimpanzee and then decided if the subject was in a position to see the reach and then start the trial by removing the occluder on the stooge side. During the trial the fixing nail on the decision panel was removed under the same conditions. The experimenter observed if the subject saw the reach to unlock the decision panel by removing the fixing nail.

Second, if the subject provided the irrelevant tool in the test condition, in some cases, the sucking noise was still audible while the stooge was drinking the juice. It remains unclear, if this noise caused any kind of disturbance for the subject, who learned that only the relevant tool was working to drink juice. This factor could not be ruled out as possible disruptive factor. However, it may be assumed, that the noise did not affect or significantly influenced the behavior of the subject, because no behavior change was observed in the subject. There were no special vocalization or agitations while and after the noise occurred, no behavioral differences were observed in trials where the noise was audible compared to those where it wasn't. The subjects normally succeeded in the task. In the control condition, where no juice box was needed, the juice was given through a syringe, which minimalized and even made the sucking noise completely not audible. Nevertheless, this confounding should be rethought for a follow-up study.

The same issue of noise occurred when the pellets were put into the buckets or moved out of the buckets. In the most cases throughout the sessions, the noise could be reduced or even fully drowned by making some additional noise with the tool occluder and the apparatus. This solution may not be optimal and as a possible solution, some tissue could be put into the buckets, which could eliminate a potential residual noise. This was omitted in this study in order to avoid any possible disturbance or irritation throughout the conditions by adding or removing objects and to make sure that at any time, subjects and stooges experienced the same conditions in the initial way.

Third, even if it is suggested, that the pellet given to the subject after each finished trial to keep them motivated in the task should not have any conditioned effect, it could still be an influencing factor. This was a discussion point for this study. But taking into account the ongoing procedure, the fundamental aspect of keeping all conditions the same for each individual and each condition for the validity of the results, this factor was not changed during this study. Even if one minute should be sufficient to rule out a possible connection between

the subjects' action and the pellet given, to completely rule out a potential wrong oriented motivational effect, the reward could completely be omitted in a follow-up study.

Outlook

Several options and ways can be followed-up on future studies investigating helping, especially paternalistic helping behavior in chimpanzees. Based on the findings of this study, the phylogenetic roots of genuine prosocial behavior seem to run deep into evolution and the previous assumption of it's high degree of uniqueness in humans shrinks in face of the fact, that chimpanzees seem to have concern for others' needs and are motivated enough to help them fulfill their goal.

With regard to the rank hierarchy and the different roles in the group of chimpanzees', according to the ages of the chimpanzees as a possible reason underlying helping behavior, the task could be investigated with controlled pairs of dyad. Moreover a possible kin-related effect could be investigated. This could provide even more light inside the motivation under-lying chimpanzees' helping behavior.

In this study, the weak test condition was constructed in a way, that the subject chim-panzee had more information concerning the tools compared to the stooge chimpanzee. Therefore, the response to the reach was based on initially different information for both chimpanzees. A strong paternalism condition, without occluder on top of the tools, providing the same information to both of the chimpanzees, providing a full sight of the tools to both of them, could bring to light even more motivational aspects underlying such prosocial behavior.

Regardless of the possible better solutions for follow-up studies, jumping over the sci-entific barriers and leaving all the empirical trends aside for one second, the fact that, coming very naturally, just one chimpanzee decides to help and even correct his conspecific to help him fulfill his goal, going through divers simultaneous and parallel cognitive and emotional steps, which requires complex psychological, biological and physiological mechanism and taking into account all external and internal influences, social patterns, life circumstances and potential inner dilemmas. If just one chimpanzee is motivated to help, not only to finish un-fulfilled actions, but to help in a costly way, providing himself no reward or any kind of di-rect social or personal advantage, from a purely observational point of view, without trying to evaluate or categorize, this apparently simple pressing of a tool, this snapshot of a second is showing a picture of a moment, an image deep into evolutionary roots of prosocial behavior, connecting all similarities' and difference through which we evolved. Witnessing just one of

this interaction is a step towards closing the gap a little bit more and providing a beautiful image of an astonishing natural and animal kingdom in which we live.

References

DeWall, F. & Suchak, M. (2010). Prosocial primates: selfish and unselfish motivations. *Phil. Trans. R. Soc. B*, 365, 2711-2722. doi:10.1098.rstb.2010.0119

Dunfield, K., Kuhlmeier, V.A., O'Connell, L. & Kelley, E. (2011). Examining the diversity of prosocial behaviour: Helping, sharing, and comforting in infancy. *Infancy*, 16, 227-247. doi:10.1111/j.1532-7078.2010.00041.x

Grill, K. (2007). The normative core of paternalism. *Res Publica*, *13* (4), 441-458. doi:10.1007/s11158-007-9036-9

Greenberg, J.R., Hamann, K., Warneken, F. & Tomasello, M. (2010). Chimpanzee helping in collaborative and non-collaborative contexts. *Animal Behaviour*, 80, 873-880. doi:10.1016/j.anbehav.2010.08.008

Hay, D.F. (2009). The roots and branches of human altruism. *British Journal of Psychology*, 100, 473-479. doi:10.1348/000712609X442096

Hamlin, J.K., Wynn, K. & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature*, 450, 557-559. doi:10.1038/nature06288

Hare, B. & Kwetuenda, S. (2010). Bonobos voluntary share their own food with others. *Current Biology*, *20* (5), 230-231. doi:10.1016/j.cub.2009.12.038

Hepach, R., Vaish, A. & Tomasello, M. (2012). Young children are intrinsically motivated to see others helped. *Psychological Science*, *23*(9), 967-972

Hothorn, T. & Hornik, K. (2013). exactRankTests: Exact Distribution for Rank and Permutation Tests. R package version 0.8-27. http://CRAN.R-project.org/package=exactRankTests

Jordan, J.J., Peysakhovich, A. & Rand, D.G. (2014). Why we cooperate. To appear in Jean Decety & Thalia Wheatley (eds.). *The moral brain: Multidisciplinary perspectives*. Cambridge: MIT Press

Kappeler, P.M. & van Schaik, C.P. (2006). *Cooperation in primates and humans. Mechanism and evolution*. Berlin Heidelberg: Springer-Verlag.

Kappeler, P.M. & van Schaik, C.P. (2006). Cooperation in primates and humans: closing the gap. In Kappeler, P.M. & van Schaik, C.P. (eds.), *Cooperation in primates and humans. Mechanism and evolution* (pp. 3-21). Berlin Heidelberg: Springer-Verlag.

Liebal, K., Vaish, A., Haun, D. & Tomasello, M. (2014). Does sympathy motivate prosocial behaviour in great apes? *Plos One*, *9*(1), e84299. doi:10.1371/journal.pone.0084299

Liszkowski, U., Carpender, M., Striano, T. & Tomasello, M. (2006). 12- and 18- month-olds point to provide information for others. *Journal of cognition and development*, *7*(2), 173-187

Martin, A. & Olson, K.R. (2013). When kids know better: paternalistic helping in 3-year-old children. *Development Psychology*, *49* (11), 2071-2081. doi:10.1037/a0031715

Melis, A.P., Hare, B. & Tomasello, M. (2008). Do chimpanzee reciprocate received favours? *Animal behaviour*, 76, 951-962. doi:10.1016/j.anbehav.2008.05.014

Melis, A.P., Warneken, F., Jensen, K., Schneider, A.-C., Call, J. & Tomasello, M. (2011). Chimpanzees help conspecifics obtain food and non-food items. *Proc. R. Soc. B*, 278, 1405-4013

Melis, A.P. & Tomasello, M. (2013). Chimpanzees' (Pan troglodytes) strategic helping in a collaborative task. *Biol. Lett.*, 9, 20130009

Over, H. & Carpender, M. (2009). Eighteen-month-old infants show increased helping following priming with affiliation. *Psychological Science*, *20*(10), 1189-1193, doi:10.1111/j.1467-9280.2009.02419.x

Pelé, M., Dufour, V., Thierry, B. & Call, J. (2009). Token transfers among great apes (Gorilla gorilla, Pongo pygmaeus, Pan paniscus, and Pan tryglodytes): species differences, gestural requests, and reciprocal exchange. *Journal of Comparative Psychology*, 123 (4), 375-384. doi:10.1037/a0017253

Rand, D.G., Greene, J.D. & Novak, M.A. (2012). Spontaneous giving and calculated greed. *Nature*, 489, 427-430, doi:10.1038/nature11467

R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Comuting. Vienna. Austria. URL http://www.R-project.org/.

Silk, J.B. (2006). Who are more helpful, humans or chimpanzees? *Science*, 311, 1248. doi:10.1126/science.1125141

Svetlova, M., Nichols, S.R. & Brownell, C.A. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Dev.*, *81*(6), 1814-1827. doi:10.1111/j.1467-8624.2010.01512.x.

Tomasello, M. (2008). Why we cooperate. Cambrige Mass: The MIT Press

Tomasello, M. (2012). Why be nice? Better not think about it. *Trends in Cognitive Science*, 16 (12), 580-581. doi:http://dx.doi.org/10.1016/j.tics.2012.10.006

Tomasello, M. & Vaish, A. (2013). Origins of human cooperation and morality. *Annu. Rev. Psychol.*, 64, 231-255. doi:10.1146/annurev-psych-113011-143812

Vaish, A., Carpender, M. & Tomasello, M. (2009). Sympathy through affective perspectives taking and its relation to prosocial behavior in toddlers. *American Psychological Association*, 45(2), 534-543. doi:10.1037/a0014322

Warneken, F. & Tomasello, M. (2006). Altruistic helping in infants and young chimpanzees. *Science*, 311, 1301-1303

Warneken, F. Chen, F. & Tomasello, M. (2006). Cooperative activities in young children and chimpanzees. *Child Development*, *77*(3), 640-663

Warneken, F. & Tomasello, M. (2007). Helping and cooperation in 14 months of age. *Infancy*, 11 (3), 271-294

Warnecken, F. & Tomasello, M. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Development Psychology*, *44*(6), 1785-1788. doi:10.1037/a0013860.supp

Warneken, F. & Tomasello, M. (2009). Varieties of altruism in children and chimpanzees. *Trends in Cognitive Science*, *13*(9), 397-402. doi:10.1016/j.tics.2009.06.008

Warneken, F., Hare, B., Melis, A.P., Hanus, D. & Tomasello, M. (2007). Spontaneous altruism by chimpanzees and young childen. *Plos Biology*, *5*(7), e184. doi:10.1371/journal. pbio.0050184

Yamamoto, S., Humle, T. & Tanaka, M. (2012). Chimpanzees flexible targeted helping based on an understanding of conspecifics goals. *PNAS*, *109*(9), 3588-3592

Zahn-Waxler, C., Radke-Yarrow, M. & Wagner, M. (1992). Development of concerns of others. *Developmental Psychology*, *28*(1), 126-136

Appendix

Appendix A   Testing coding sheet

Appendix A

Testing coding sheet

TESTING Paternalism Study

date	chimp dyad		condition	day
	stooge:	**subject:**	**Session 1 - weak**	l

Session 1				Session 1				Session 1			
CONTROL 4x				**CONDITION 8x**				**CONTROL 4x**			
stooge reaches for:		subject gives the:		stooge reaches for:		subject gives the:		stooge reaches for:		subject gives the:	
rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool
	l				l				r		
	r				l				r		
	r				r				l		
	l				l				l		
					r						
					r						
					r						
					l						

date	chimp dyad		condition	day
	stooge:	**subject:**	**Session 2 - weak**	l

Session 2				Session 2				Session 2			
CONTROL 4x				**CONDITION 8x**				**CONTROL 4x**			
stooge reaches for:		subject gives the:		stooge reaches for:		subject gives the:		stooge reaches for:		subject gives the:	
rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool	rel. tool	irr. tool
	r				r				l		
	l				r				r		
	r				r				l		
	l				l				r		
					r						
					l						
					l						
					l						

Note: per subject & stooge = 2 sessions, then switch stooges & same procedure | ABA = 4x8x4x | stooge pellets always related to irrelevant tool | juice box only in test condition

Ich erkläre hiermit, dass ich die vorliegende Arbeit selbstständig und ohne Benützung anderer als der angegebenen Hilfsmittel verfasst habe.

Unterschrift: